Transport Accident Investigation Commission

Final interim factual report

Tuhinga whakamutunga – mō tātou tirotiro nāianei

Maritime inquiry MO-2024-204
***Passenger and freight Ferry* Aratere**
Grounding
Titoki Bay, Picton
21 June 2024

October 2024

The Transport Accident Investigation Commission
Te Kōmihana Tirotiro Aituā Waka

No repeat accidents – ever!

"The principal purpose of the Commission shall be to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future, rather than to ascribe blame to any person."

Transport Accident Investigation Commission Act 1990, s4 Purpose

The Transport Accident Investigation Commission is an independent Crown entity and standing commission of inquiry. We investigate selected maritime, aviation and rail accidents and incidents that occur in New Zealand or involve New Zealand-registered aircraft or vessels.

Our investigations are for the purpose of avoiding similar accidents and incidents in the future. We determine and analyse contributing factors, explain circumstances and causes, identify safety issues, and make recommendations to improve safety. Our findings cannot be used to pursue criminal, civil, or regulatory action.

At the end of every inquiry, we share all relevant knowledge in a final report. We use our information and insight to influence others in the transport sector to improve safety, nationally and internationally.

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Investigator-in-Charge for this inquiry	Rob Thompson
Commission General Counsel	Cathryn Bridge

Notes about Commission reports
Kōrero tāpiri ki ngā pūrongo o te Kōmihana

Nature of this interim factual report

The Transport Accident Investigation Commission (the Commission) has issued this interim factual report in the initial stages of the investigation. This interim factual report presents the facts and circumstances established up to this point in the Commission's inquiry. The Commission may issue an interim report in line with international guidance where inquiries are complex and ongoing.

Final report

The investigation is ongoing across multiple lines of inquiry. Upon the completion of the full investigation, the Commission will issue a final report on the incident. That report will contain an analysis of the facts of the incident, findings and recommendations. The information contained in the Commission's final report may differ from the information contained in this interim factual report.

Photographs, diagrams, pictures

The Commission owns the photographs, diagrams and pictures in this report unless otherwise specified.

Verbal probability expressions

For clarity, the Commission uses standardised terminology where possible.

One example of this standardisation is the terminology used to describe the degree of probability (or likelihood) that an event happened, or a condition existed in support of a hypothesis. The Commission has adopted this terminology from the Intergovernmental Panel on Climate Change and Australian Transport Safety Bureau models. The Commission chose these models because of their simplicity, usability and international use. The Commission considers these models reflect its functions. These functions include making findings and issuing recommendations based on a wide range of evidence, whether or not that evidence would be admissible in a court of law.

Terminology	Likelihood	Equivalent terms
Virtually certain	> 99% probability of occurrence	Almost certain
Very likely	> 90% probability	Highly likely, very probable
Likely	> 66% probability	Probable
About as likely as not	33% to 66% probability	More or less likely
Unlikely	< 33% probability	Improbable
Very unlikely	< 10% probability	Highly unlikely
Exceptionally unlikely	< 1% probability	

Figure 1: Passenger and freight ferry *Aratere* aground in Titoki Bay

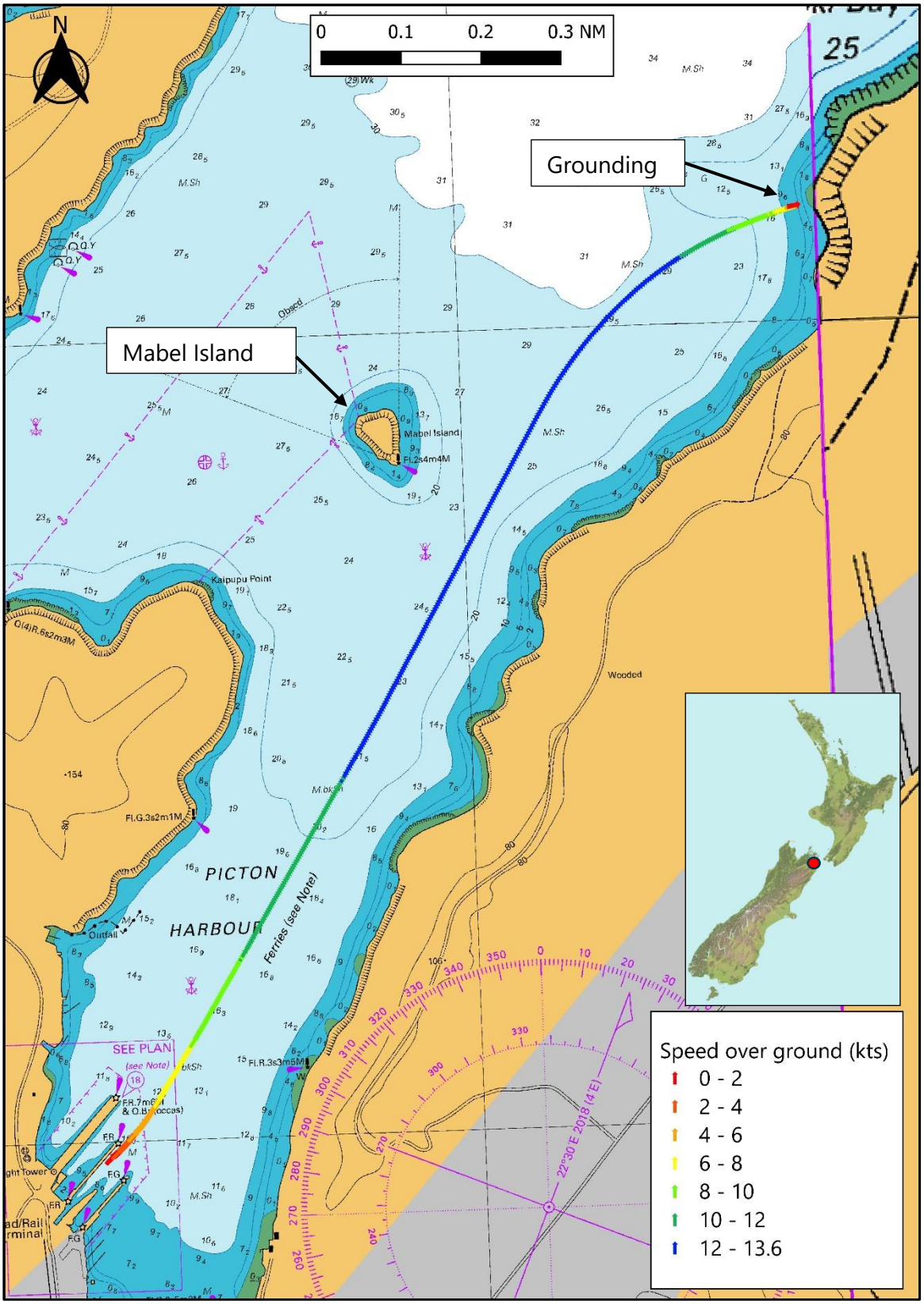

Figure 2: Track of *Aratere* and location of grounding (derived from automatic identification system data)

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1 Factual information
Pārongo pono

Background information

1.1. *Aratere* was purpose built in 1998 for Tranz Rail to operate on the Cook Strait interisland ferry service[1]. The ship is currently owned and operated by KiwiRail.

1.2. The ship had been in service for about 26 years. KiwiRail identified that the control system for the steering machinery[2] (the steering control system) would be replaced because spare parts were becoming difficult to source and waning manufacturer support.

1.3. The purpose of the steering control system was to relay the rudder commands from the navigators on the bridge to the electro-hydraulic steering motors located in the steering room at the stern[3], which then turned the twin rudders to match the commands from the bridge.

1.4. On the bridge, steering could be controlled from any one of five command consoles (*see* Figure 3):

- the port[4] bridge wing console
- the starboard[5] bridge wing console
- the centre pilot console
- the central helmsman[6] steering console (which contained the wheel)
- the track pilot module[7] (incorporating the autopilot).

1.5. Control of the rudders could be transferred to any one of the five command consoles.

1.6. In September 2023 KiwiRail had opted to replace the steering control system with a system produced by Kongsberg[8].

1.7. This had involved replacing the controls at each of the command consoles, except for the autopilot. The autopilot was part of the original track pilot integrated bridge navigation system by a different manufacturer. The new Kongsberg steering control system was integrated with the track pilot.

1.8. The Kongsberg steering control system had been installed and commissioned during a 'wet docking'[9] period in Wellington between 11 and 30 May 2024.

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[1] Between Wellington in the North Island and Picton in the South Island.
[2] The electro-hydraulic system and rudders.
[3] The aft-most end of the ship.
[4] The left-hand side of the ship looking forward.
[5] The right-hand side of the ship looking forward.
[6] A person who steers a vessel.
[7] A module within an integrated bridge navigation system that includes an electronic chart display and information system, radar, position indicating systems and sensors for example, ship speed, rates of turn and water depth.
[8] A major industry supplier of sensors, robotics and digital systems.
[9] An extended period out of service to conduct maintenance not requiring the ship to be dry-docked.

1.9. The following narrative has been derived from data downloaded from the ship's voyage data recorder, the new Kongsberg steering control system and interviews with the crew.

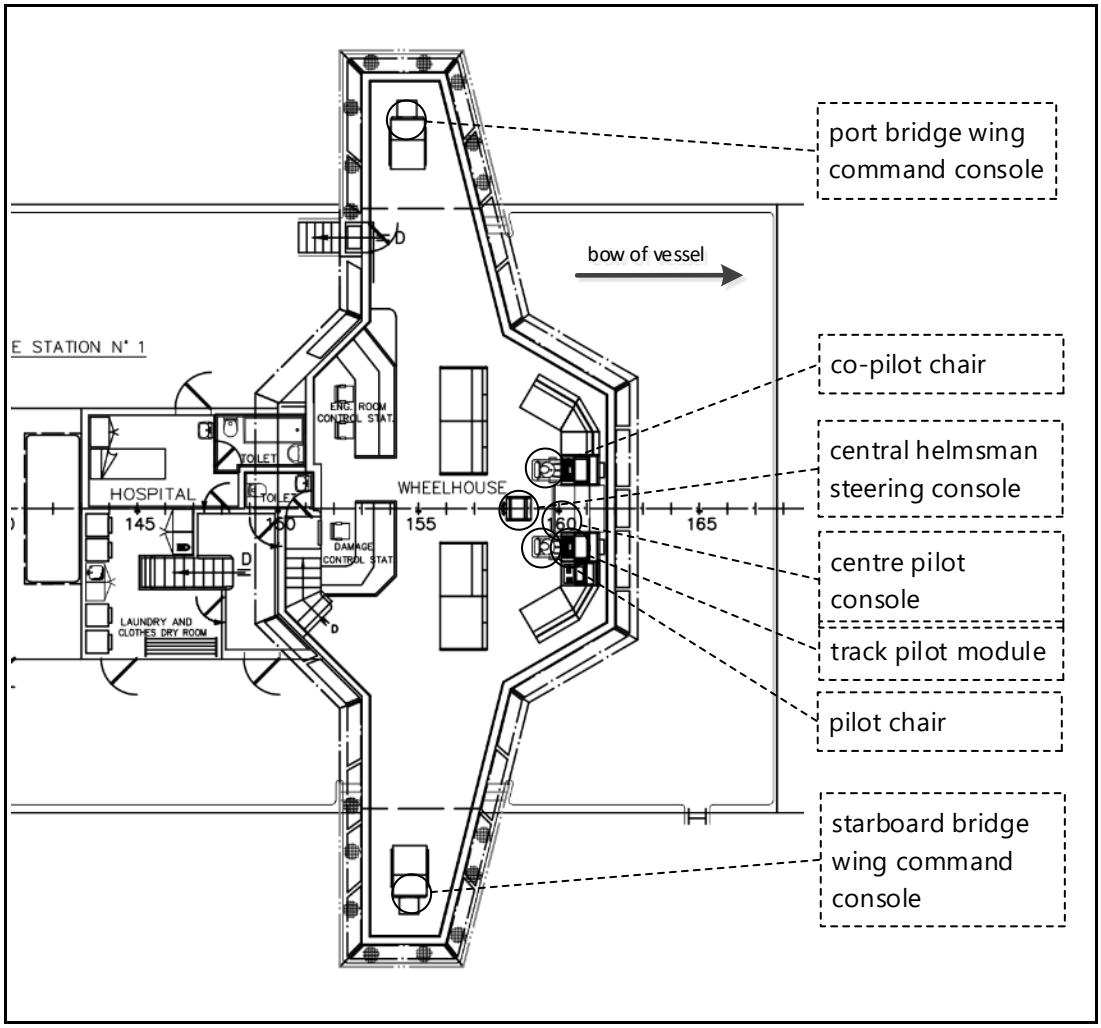

Figure 3: General arrangement of *Aratere*'s bridge

Narrative

1.10. After re-entering service following the installation and commission of the new Kongsberg steering control system, *Aratere* completed 83 inter-island crossings in the subsequent three weeks.

1.11. On 21 June 2024 *Aratere* departed Wellington bound for Picton, berthing at Picton by 2020.

1.12. Cargo loading on the *Aratere* was completed at about 2110 hours. Two masters were onboard to share the workload (day master and night master). The night master was in command for the departure from Picton while the day master was resting.

1.13. An additional experienced master was also on board to re-familiarise themselves with the ship, having not sailed on *Aratere* for some time (the re-familiarisation master). Normally the night master would have been the pilot and the officer of the watch (OOW)[10] would have been the co-pilot. For the departure from Picton, the night

[10] The deck officer assigned to watch keeping and navigation on a ship's bridge.

master was acting as co-pilot, supervising the re-familiarisation master who was acting as pilot.

1.14. The OOW was on the bridge assisting as required. There were also two deck ratings[11] on the bridge, one acting as lookout and the other as helmsman[12].

1.15. *Aratere* left the berth at 2119. The re-familiarisation master was operating the engine controls from the port[13] bridge wing, supervised by the night master. The helmsman was steering the ship using the central wheel.

1.16. Once clear of the berth, the re-familiarisation master asked the helmsman to steer 030° true to head for the first waypoint[14] off Mabel Island, and soon after that adjusted the course to 028°, as *Aratere* was slightly to starboard of the track. The night master transferred control of the engines to the centre pilot console.

1.17. The course between the Mabel Island waypoint and the next waypoint, being Snout waypoint[15], was 033° true. This was a small alteration of 3 degrees to starboard (*see* Figure 4).

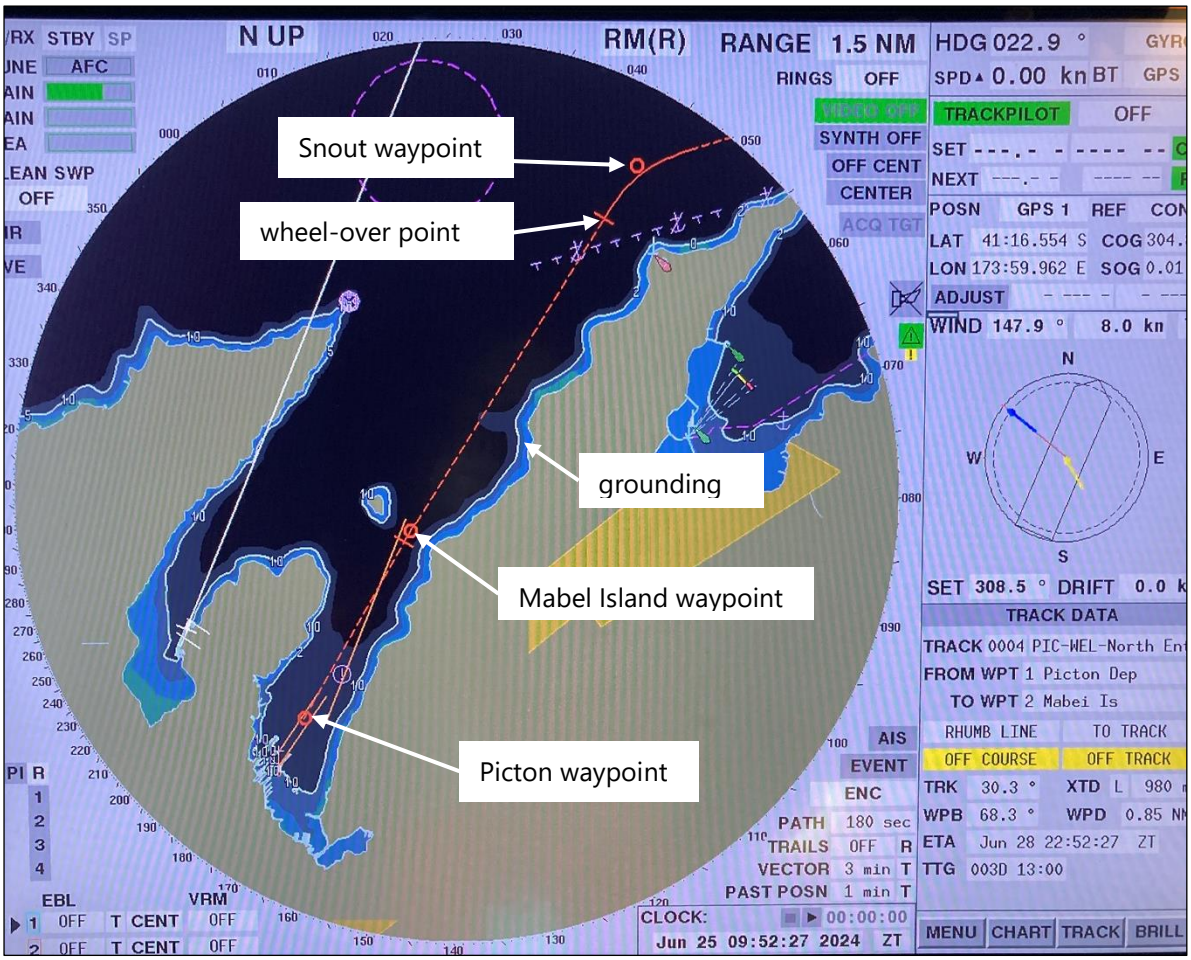

Figure 4: Screenshot from *Aratere*'s electronic chart display and information system showing planned tracks as red dotted lines and waypoints as red circles

[11] Skilled seafarers who provide support with navigation, maintenance, security and other shipboard operations.
[12] Person steering the ship from the central helm control.
[13] Port bridge wing.
[14] A coordinate or location along a route, usually where the course changes or a voyage starts or terminates.
[15] Programmed into the ECDIS as Picton Point.

1.18. The night master normally waited until the ship was clear of Mabel Island before engaging the autopilot. When *Aratere* was about abeam[16]of Mabel Island, the night master and re-familiarisation master discussed whether to use 'heading mode'[17]or 'course mode[18]' for the autopilot. The autopilot was engaged on the ship's current heading of 028° in course mode, after which the helmsman was released from the wheel to stand by in the bridge.

1.19. From that point the direction of the ship was controlled by the autopilot through the track pilot module (*see* Figure 5).

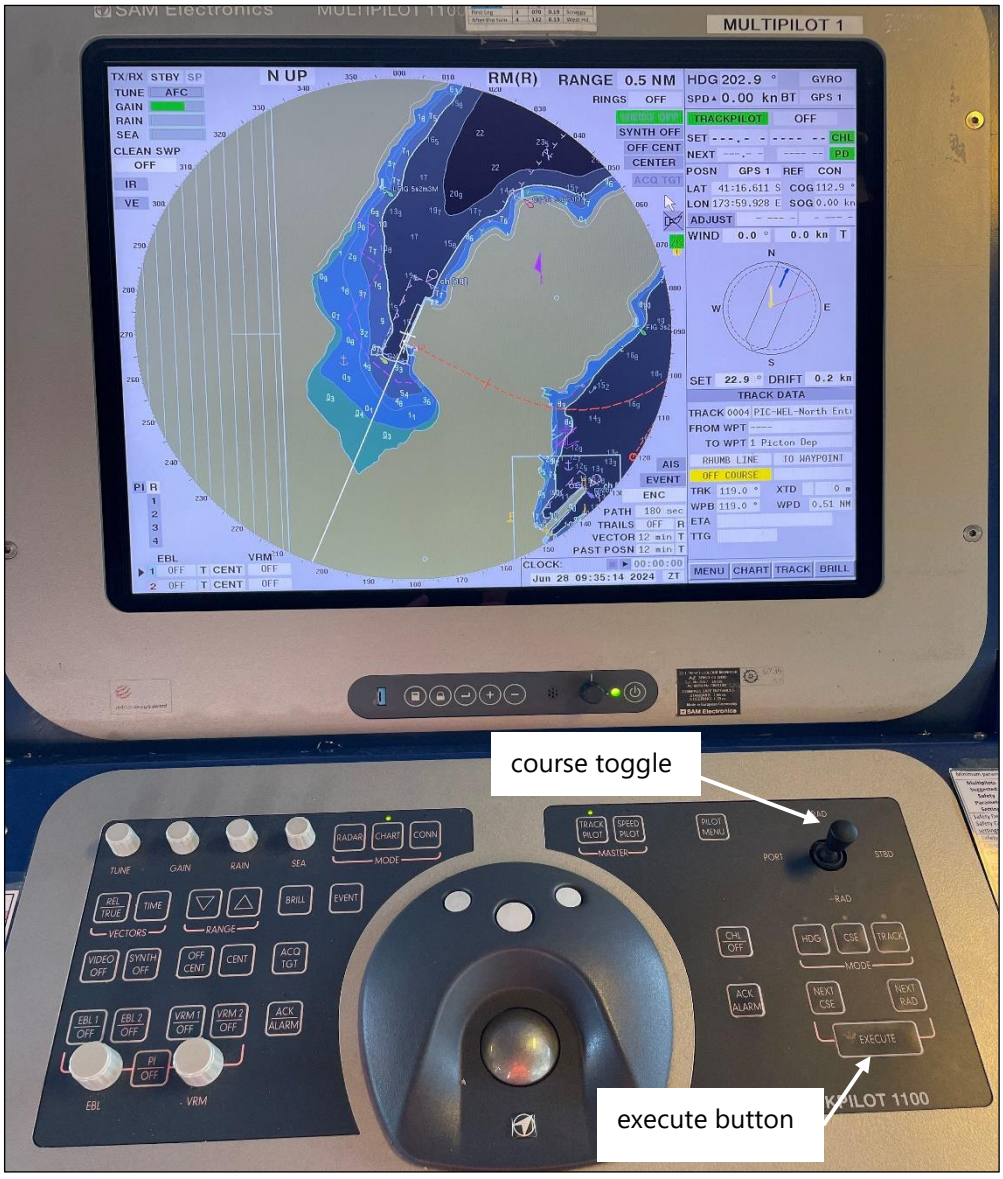

Figure 5: Track pilot incorporating autopilot function

1.20. The planned track for the passage to Wellington had been programmed into the track pilot as a series of waypoints joined by the track/course lines. The transition from one

[16] At right angles to the forward and aft lines of the ship.

[17] The ship will steer the acquired heading

[18] The ship will steer the acquired heading but will automatically detect any sideways deviation due to current and wind and adjust the heading to achieve the acquired course.

course to the next at each waypoint was programmed as an arc with a set radius. A wheel-over point[19] was displayed prior to each waypoint (*see* Figure 4).

1.21. When in course or track mode, pilot data mode can be selected, which results in the track pilot module alarms to warn the pilot when the ship is approaching a wheel-over point. However, in course mode the track pilot will not automatically begin the turn. The pilot must push the 'execute' button, upon which the track pilot will apply the required rudder to take the ship around the programmed arc onto the next course. The pilot can make manual adjustments to the course using the course toggle control (*see* Figure 5).

1.22. Once the ship has passed a waypoint, the track pilot will automatically lock onto the radius turn for the next waypoint and the next course after achieving the turn.

1.23. The autopilot was engaged at 2126:01 when the ship was on a heading of 028°. The re-familiarisation master pushed the execute button at 2126:30[20]. However, *Aratere* had already passed the Mabel Island waypoint 36 seconds earlier and the track pilot had already automatically locked on to the next, more substantial turn around the Snout waypoint.

1.24. The track pilot module applied 9°of initial starboard rudder and began to make a controlled turn as if the ship were making the turn around the Snout waypoint.

1.25. After 31 seconds the night master realised from the electronic chart display and information system (ECDIS) that *Aratere* was deviating to starboard of the track towards the shore. The night master immediately instructed the helmsman to take over steering on the wheel, which was located on the central helmsman steering console, and to put the rudder 'hard over to port'.

1.26. Figure 6 shows a marked-up screenshot of *Aratere*'s ECDIS near the time the night master became aware that *Aratere* was deviating from the planned track. The set course was displayed as 73.8° with a radius turn of 0.43 nautical miles, which was the next turn and course around the Snout waypoint. The ship predictor is a feature that shows the pilot where the ship will be in the immediate future based on the ship's current speed and rate of turn.

[19] The point at which a turn is initiated.

[20] As detailed by the post-accident technical report provided by the equipment service technician. The VDR recorded when the command was actioned.

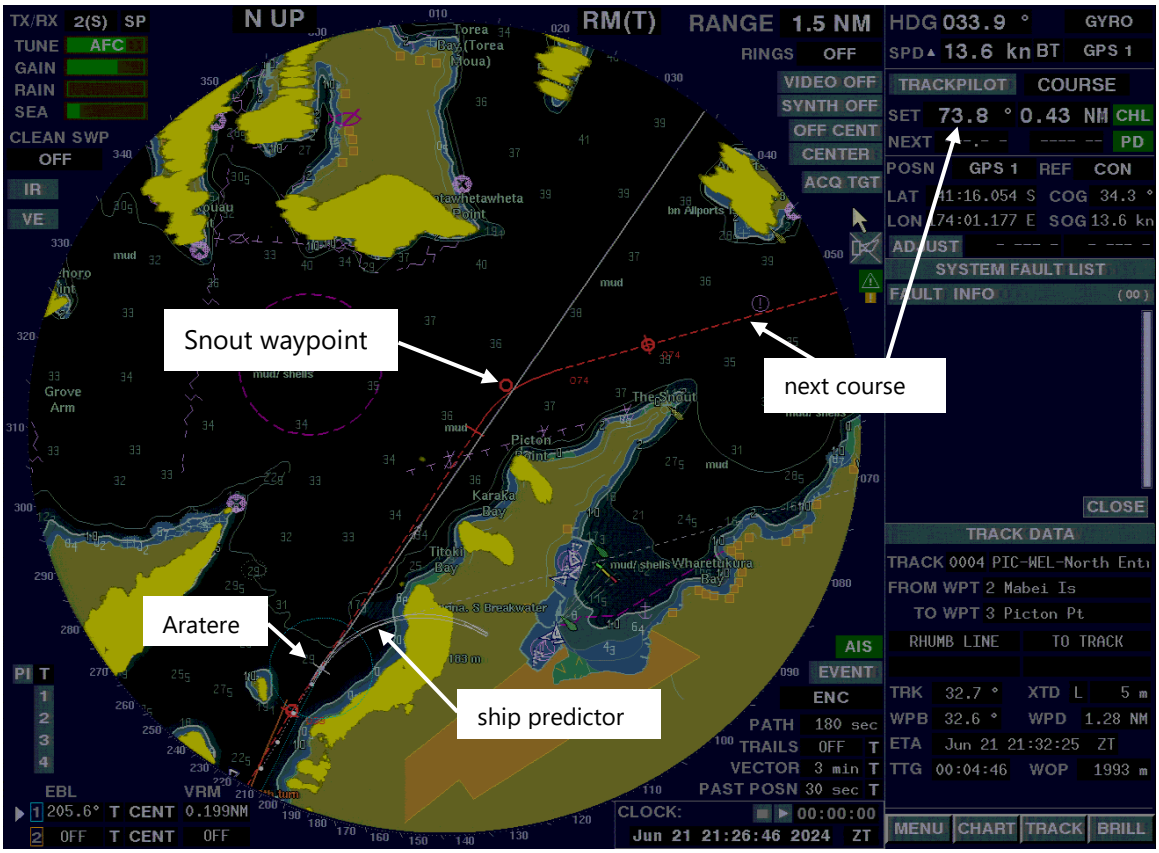

Figure 6: Screenshot from *Aratere* ECDIS near the time the night master became aware that *Aratere* was deviating from the planned track

1.27. The helmsman pressed the 'takeover' button on the central helmsman steering console and turned the wheel hard to port. However, the transfer of steering command from the track pilot module to the wheel position did not occur and *Aratere* continued its turn to starboard, controlled by the autopilot.

1.28. The OOW rushed to the central helmsman steering console and pushed the takeover button, but with the same result. The autopilot had applied starboard rudder, but the helmsman had the wheel set to amidships[21], meaning the rudder commands between the two command consoles were not aligned.

1.29. The night master also attempted to take control of the rudders at the centre pilot console, but without success.

1.30. A feature of the new Kongsberg steering control system was that control of the steering did not transfer from one command console to another unless the rudder commands at each console were aligned to within 2°. This feature differed from the procedure under the old steering control system, which would have allowed the transfer to occur even if the rudder commands had not been aligned.

1.31. However, the transfer of misaligned rudder commands could still be achieved with the new Kongsberg steering control system through the use of the 'force takeover' feature. This involved a member of the bridge team pushing down and holding the takeover button for approximately five seconds. The bridge team were not aware of either the need to align the rudder commands nor the force takeover feature.

[21] A command to align the rudders with the fore and aft centreline of a ship.

1.32. At 2127:43, recognising that the helmsman did not have control of the steering and seeing that *Aratere* was already heading towards the shore, the night master put both engine combinators[22] at full astern[23] (41 seconds after noticing *Aratere* veering to starboard). *Aratere* was moving at 13 knots (nautical miles per hour) over the ground at that time.

1.33. It took 21 seconds for the port propeller and 38 seconds for the starboard propeller to begin turning astern, at 2128:04 and 2128:21 respectively.[24]

1.34. Records show that at 2128:06 the alternative non-follow-up mode of steering[25] was engaged, this mode used the independent tillers on the centre pilot console. The port rudder moved hard to port (32°) and the starboard rudder moved 13° to port.

1.35. During this sequence the night master instructed the OOW to start one of the ship's bow thrusters[26] to assist the manoeuvring of the ship.

1.36. At 2128:34 *Aratere* crossed the 10 metre sounding[27] at about 7 knots, at 2128:46 the speed had dropped to about 3 knots. By 2128:50 the vessel had stopped and was aground on a heading of 76.5°[28].

1.37. The watertight integrity of *Aratere*'s hull was not compromised, but the ship did sustain damage to the internal structure of the bulbous bow that required remedial repair before its being put back into service. There were no injuries.

1.38. In the following 48 hours various authorities were involved in overseeing *Aratere* being refloated using two Picton-based harbour tugs.

Lines of inquiry

1.39. The Commission is continuing to collate and verify evidence directly related to the grounding and is pursuing several lines of inquiry of a systemic nature.

[22] The lever that controls the speed and direction of the ship's propulsion systems.

[23] Moving aft or towards the rear of the vessel.

[24] The starboard propeller shaft was running on reduced power due to a gearbox issue.

[25] A mode in which the rudder will continue to move in the direction in which the lever is placed until the lever is released, after which the rudder will stay in that position until the lever is moved again.

[26] A propulsion unit mounted in an athwartships tunnel near the bow that is used to thrust the bow to port or starboard when manoeuvring.

[27] Water depth of 10 metres on the chart where the vessel would have been clear of the seabed

[28] Deceleration of the vessel was due to the actions taken by the crew and then also the friction of the vessel on the seabed as it ran aground. The precise time the vessel touched the seabed is yet to be determined.

2 Data summary
Whakarāpopoto raraunga

Vehicle particulars

Name:	*DEV Aratere*
Type:	Ro-Ro passenger ship (rail and road vehicular)
Class:	SOLAS
Limits:	Unlimited
Classification:	Det Norske Veritas
Length:	183.69 metres
Breadth:	20.5 metres
Built:	1998 in Spain
Propulsion:	Diesel-electric: four electric motors, two on each shaft, driving fixed-pitch, propellors
Service speed:	20 knots
Owner/operator:	KiwiRail
Port of registry:	Wellington

Date	21 June 2024
Location	Picton Harbour
Persons involved	36 crew and eight passengers
Injuries	nil
Damage	moderate internal structural damage to forepeak tank

3 Conduct of the inquiry
Te whakahaere i te pakirehua

3.1. On 22 June 2024 Maritime New Zealand notified the Commission of the occurrence. The Commission subsequently opened an inquiry under section 13(1) of the Transport Accident Investigation Commission Act 1990 and appointed an investigator in charge.

3.2. The Commission issued a protection order under Section 12 of the Transport Accident Investigation Commission Act 1990, to preserve and protect the voyage data recorder and the various components of *Aratere*'s steering system.

3.3. On 22 June 2024, three investigators travelled to Picton to gather information, staying there until 25 June. On 27 June two of the investigators returned to Picton again to gather information, staying until 27 June.

3.4. On 28 August 2024 the Commission approved a draft interim factual report for circulation to four interested parties for their comments.

3.5. Three interested parties provided detailed submissions, and one interested party did not provide a submission. Any changes as a result of the submissions have been included in the final report.

3.6. On 25 September 2024, the Commission approved the final interim factual report for publication.

Abbreviations
Whakapotonga

ECDIS	electronic chart display and information system
°	degrees
OOW	officer of the watch

Glossary
Kuputaka

helmsman	a person who steers a vessel
officer of the watch	the deck officer assigned with the duties of watch keeping and navigation on a ship's bridge
port	the left hand side of a ship looking forward
starboard	the right hand side of a ship looking forward
waypoint	a coordinate or location along a route, usually where the course changes or a voyage starts or terminates

Kōwhaiwhai - Māori scroll designs

TAIC commissioned its four kōwhaiwhai, Māori scroll designs, from artist Sandy Rodgers (Ngāti Raukawa, Tūwharetoa, MacDougal). Sandy began from thinking of the Commission as a vehicle or vessel for seeking knowledge to understand transport accident tragedies and how to avoid them. A 'waka whai mārama' (i te ara haumaru) is 'a vessel/vehicle in pursuit of understanding'. Waka is a metaphor for the Commission. Mārama (from 'te ao mārama' – the world of light) is for the separation of Rangitāne (Sky Father) and Papatūānuku (Earth Mother) by their son Tāne Māhuta (god of man, forests and everything dwelling within), which brought light and thus awareness to the world. 'Te ara' is 'the path' and 'haumaru' is 'safe' or 'risk free'.

Corporate: Te Ara Haumaru - the safe and risk free path

The eye motif looks to the future, watching the path for obstructions. The encased double koru is the mother and child, symbolising protection, safety and guidance. The triple koru represents the three kete of knowledge that Tāne Māhuta collected from the highest of the heavens to pass their wisdom to humanity. The continual wave is the perpetual line of influence. The succession of humps represents the individual inquiries.

Sandy acknowledges Tāne Māhuta in the creation of this Kōwhaiwhai.

Aviation: Ngā hau e whā - the four winds

To Sandy, 'Ngā hau e whā' (the four winds), commonly used in Te Reo Māori to refer to people coming together from across Aotearoa, was also redolent of the aviation environment. The design represents the sky, cloud, and wind. There is a manu (bird) form representing the aircraft that move through Aotearoa's 'long white cloud'. The letter 'A' is present, standing for a 'Aviation'.

Sandy acknowledges Ranginui (Sky father) and Tāwhirimātea (God of wind) in the creation of this Kōwhaiwhai.

Maritime: Ara wai - waterways

The sections of waves flowing across the design represent the many different 'ara wai' (waterways) that ships sail across. The 'V' shape is a ship's prow and its wake. The letter 'M' is present, standing for 'Maritime.

Sandy acknowledges Tangaroa (God of the sea) in the creation of this Kōwhaiwhai.

Rail: rerewhenua - flowing across the land

The design represents the fluid movement of trains across Aotearoa. 'Rere' is to flow or fly. 'Whenua' is the land. The koru forms represent the earth, land and flora that trains pass over and through. The letter 'R' is present, standing for 'Rail'.

Sandy acknowledges Papatūānuku (Earth Mother) and Tāne Mahuta (God of man and forests and everything that dwells within) in the creation of this Kōwhaiwhai.

Transport Accident Investigation Commission

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